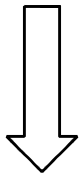
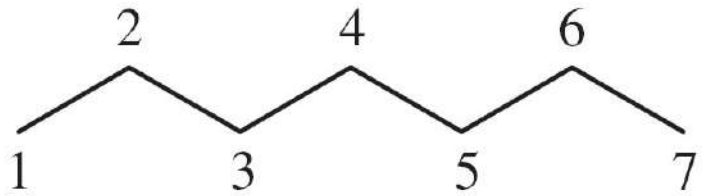
Organic Formulas and Molecular Models

This is an example of how to change a condensed structural formula into a line structure.

(condensed structural formula)





(line structure)

The table on the next slide summarize formulas and models used in organic chemistry.

Classifying Organic Compounds

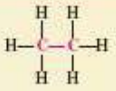
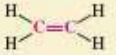
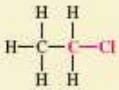
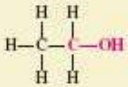
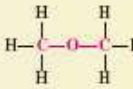
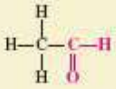
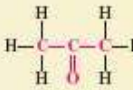
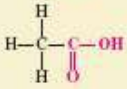
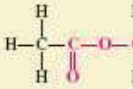
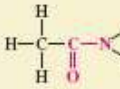
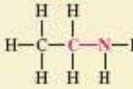
Functional groups are group of atoms *(or one atom)* that have specific behavioral characteristics in organic compounds.

Organic compounds are classified based on the functional groups that they contain.

Classifying Organic Compounds

The list of common functional groups found in organic compounds are shown here on Table 19.1.

Table 19.1 Classes of Organic Compounds

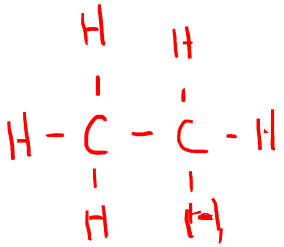
Class of compound	General formula*	IUPAC name**, ***	Molecular formula	Condensed structural formula	Structural formula
Alkane	RH	Ethane (Ethane)	C_2H_6	CH_3CH_3	
Alkene	R—CH=CH_2	Ethene (Ethylene)	C_2H_4	$H_2C{=}CH_2$	
Alkyne	R—C≡C—H	Ethyne (Acetylene)	C_2H_2	HC≡CH	
Alkyl halide	RX	Chloroethane (Ethyl chloride)	C_2H_5Cl	CH_3CH_2Cl	
Alcohol	ROH	Ethanol (Ethyl alcohol)	C_2H_6O	CH_3CH_2OH	
Ether	R—O—R	Methoxymethane (Dimethyl ether)	C_2H_6O	CH_3OCH_3	
Aldehyde	R—C(=O)—H	Ethanal (Acetaldehyde)	C_2H_4O	CH_3CHO	
Ketone	R—C(=O)—R	Propanone (Dimethyl ketone)	C_3H_6O	CH_3COCH_3	
Carboxylic acid	R—C(=O)—OH	Ethanoic acid (Acetic acid)	$C_2H_4O_2$	CH_3COOH	
Ester	R—C(=O)—OR	Methyl ethanoate (Methyl acetate)	$C_3H_6O_2$	CH_3COOCH_3	
Amide	R—C(=O)—NH_2	Ethanamide (Acetamide)	C_2H_5ON	CH_3CONH_2	
Amine	R—CH_2—NH_2	Aminoethane (Ethylamine)	C_2H_7N	$CH_3CH_2NH_2$	

* The letter R is used to indicate any of the many possible alkyl groups. ** Class name ending in italic. *** Common name in parentheses.

Functional Groups

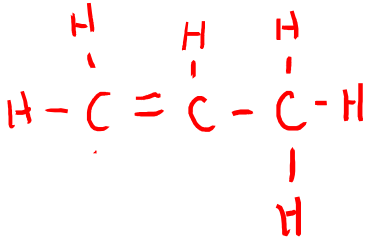
R - hydrocarbon chain

alkane



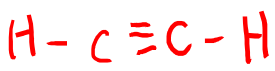
ethane CH_3CH_3

alkene



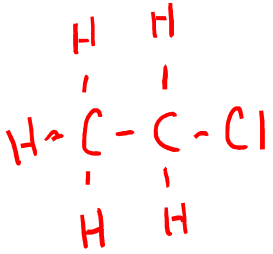
propene $CH_2=CHCH_3$

alkyne



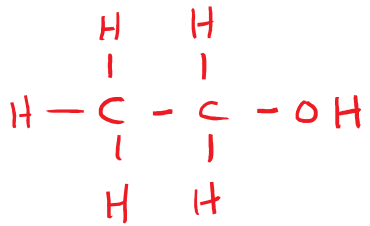
ethyne $CH\equiv CH$

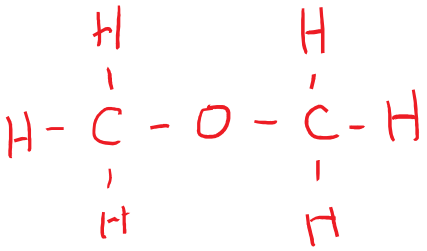
alkyl halide $R-Cl$

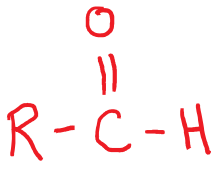
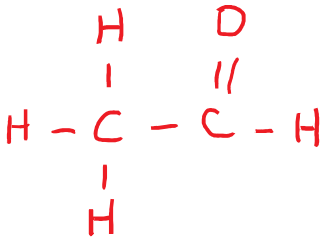


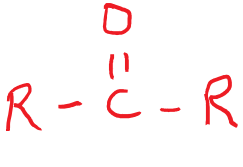
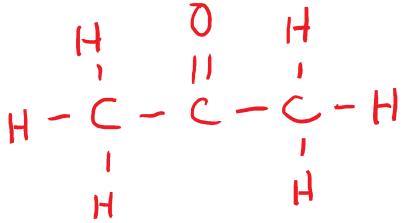
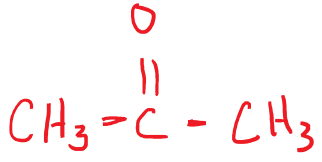
chloroethane CH_3CH_2Cl

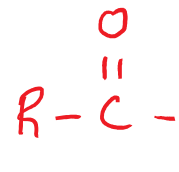
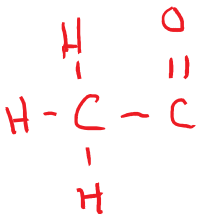
halogens
- Cl
- F
- Br
- I

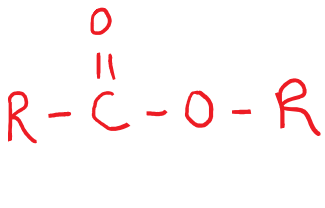
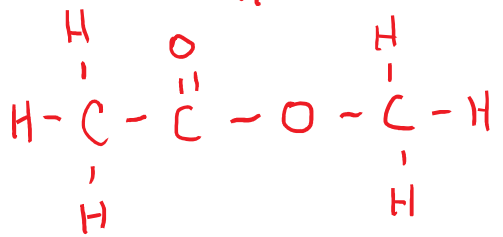
alcohol R-OH  ethanol CH_3CH_2OH

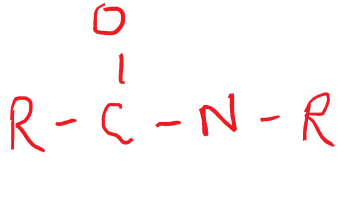
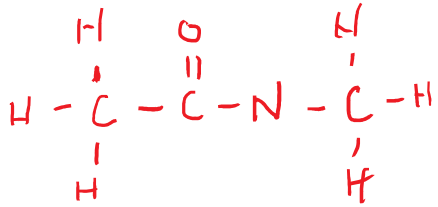
ether R-O-R  dimethyl ether CH_3-O-CH_3

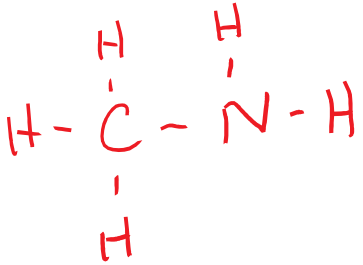
aldehyde   ethanal CH_3CHO

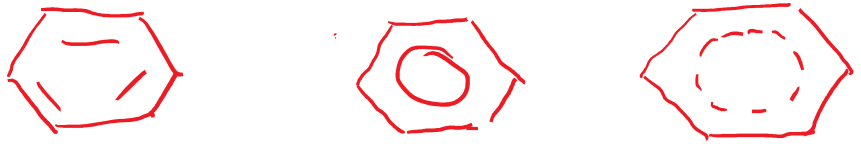
Ketone   propanone 

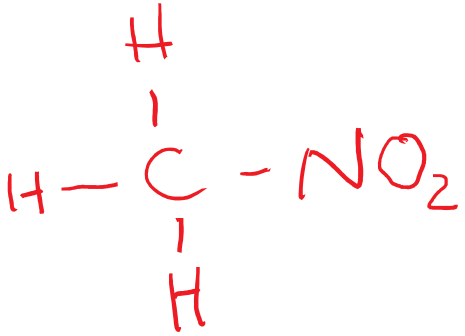
carboxylic acid   ethanoic acid CH_3COOH

ester   methyl-ethyl-ester CH_3COOCH_3

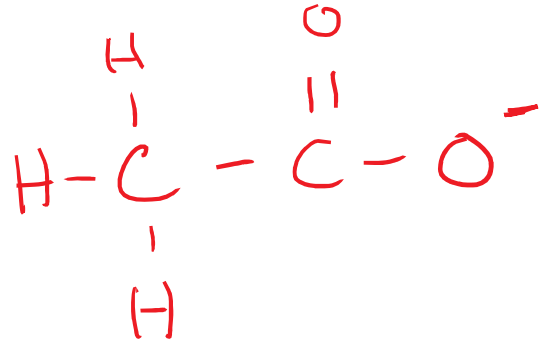
amide   methyl ethyl amide CH_3CONCH_3

amine $R-NH_2$  methyl amine CH_3NH_2

Benzene (aromatic) 

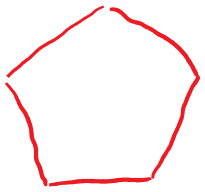
nitro $R-NO_2$ or  

Cyanide $R-CN$ or $R\equiv CN$

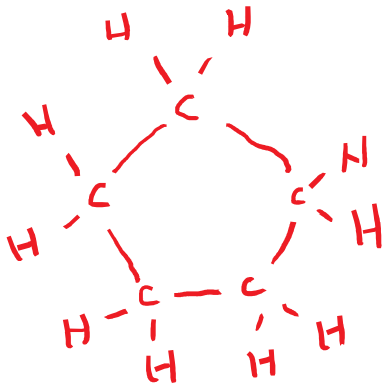
Carboxylate $R-COO^-$ 

→ Note: this is a carboxylic acid that has lost an electron. It is an ion and has a -1 charge.

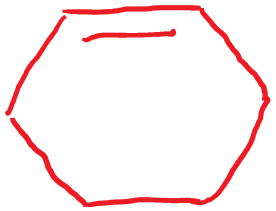
Cycloalkane



cyclopentane



Cycloalkene



cyclohexene